

STUDY ON LEAN TOOLS IMPLEMENTATION IN VARIOUS INDIAN SMALL AND MEDIUM SCALE MANUFACTURING INDUSTRIES

V. RAMAKRISHNAN, S. NALLUSAMY & M. RAJARAM NARAYANAN

Department of Mechanical Engineering, Dr. M G R Educational and Research Institute, Chennai, Tamilnadu, India

ABSTRACT

In present scenario, small and medium scale industries in India are implementing lean techniques hardly ever. Nowadays, the Government of India is also serving these kinds of small and medium scale industries in their lean journey by providing various incentives. In order to make them more competitive in the global market, other institutes like international labour organization, national productivity council and quality council of India are also helping in implementing lean tools. In recent times, many consultants have been trained in the implementation of lean tools and are being hired by the small and medium scale industries. The aim of this research is to make an attempt to capture the benefits accumulated by a group of small and medium scale industries who have attempted in lean tools implementation. The methodology adopted in implementation and the improvements achieved by these small and medium scale industries are analyzed. From the results, it was found that, the inventory ratio has been increased from 7 to 13 and the change over time is reduced from 130 minutes to 60 minutes. Finally, the production time has also been increased by about 70 minutes for every change over.

KEYWORDS: SME, Lean Tools, Inventory, Setup Time & Production

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INTRODUCTION

Nowadays, implementation of lean tools in Indian small and medium scale enterprises (SME) is widely taken up to meet the customer demand at the right time. Some of the SMEs attempt it individually, whereas many of others are doing it in a group manner. The groups of SMEs come together on the basis of geographic proximity, common customer, similar product manufacturing and processes. These groups are known as cluster of SMEs and they appoint a common consultant to implement the lean techniques in their industries. This consultant undertakes a diagnostic study of all the units in the cluster. Based on the findings of the study, an action plan will be prepared comprising of the projects to be implemented in the units. This action plan is submitted to the concerned chief executive officers of the units for their selection. A common training is organized for the key members of the units. This reduces the cost of implementation to a great extent. Then the implementation of lean techniques is carried out in the individual units to address the areas identified in the diagnostic study for their potential improvement. Unit wise trainings and shop floor implementation of lean tools are taken up. The implementation takes place over the period of one and half years to two years, during which the units meet in a common place at periodic intervals to share their experience and success stories. They also discuss the problems encountered and discuss possible solutions for them. This cluster approach reduces the cost of consultant and also accelerates the phase of improvement through cross learning.

LITERATURE REVIEW

A technology improvement in lean manufacturing's dimensions are presented and defined the usage and

knowledge of tools, techniques, crafts, systems, or methods of organization, with the aim of solving a problem or creating an artistic perspective in different earlier studies. Implementation of lean in different small and medium manufacturing industries were focused and taken the parameters like capacity and throughput rates, lead-times, quality and efficiency with operating costs. In this work, the results with basic lean tools such as 5S, standardized work, line balancing, visual controls, point of use storage, and quality at the source had validated [1-5]. Lean tools and sustainability concepts with discrete event simulation modeling and analysis as well as mathematical optimization to make a positive impact on the environment, society and its own financial success in a small furniture production companies were initiated [6-9]. A quantitative framework to transform the lean techniques in various small and medium enterprises was developed. First expression has three interrelated components such as re-engineering an organization, value stream mapping (VSM) and integrative supplier relationship. Second expression performs a just in time production schedule by using ant colony optimization technique combines with a simulation tool [10-14]. The different drivers and barriers that influences the implementations of lean manufacturing are examined in various automotive components manufacturing industries. Cluster analysis was also executed to classify the industries in groups to signify the extent of lean manufacturing implementation [20-24]. The extents of which functional and organizational measures influence employees' participation in suggestion of ideas for continuous improvement of Kaizen in various manufacturing industries were evaluated. A dynamic model of cause and effect diagram and stock and flow diagram has been proposed in lean manufacturing which is linked with technology [25-27]. Similarities and dissimilarities between lean manufacturing and value engineering management were focused and highlight the benefits of collaboration and alliance between these two different tools in the manufacturing industries [28-31]. The applications of lean manufacturing concepts to the continuous production sectors with a focus in the medium scale manufacturing industries were addressed. Also, lean manufacturing tools that adapted from the discrete to the continuous manufacturing environment with the help of VSM, work standardization and line balancing were investigated [32-36]. Based on the above, an attempt was made to capture the methodology adopted and the results achieved in a cluster of nine different SMEs in Tamilnadu.

METHODOLOGY

Lean manufacturing program organized for improving the performance and capability of SME units, a cluster comprising of nine units based in Chennai was carried out. The farm equipments manufacturer was involved in formation of this cluster. The units were involved in different business activities like machining, sheet metal forming, fabrication and forging. The major objective of this program was to improve the overall performance of these units in terms of their existing methods and practices. Lean manufacturing techniques had been taken as the way to achieve the objective of the program. The style of management differed from an owner driven units to a well-managed organization.

Data Collection and Analysis

The whole study was planned for a period of one and half years with five different phases. Initially a detailed diagnosis study was carried out to baseline the current level of performance, understand existing systems and practices. Various lean tools were used to identify the bottlenecks in the production process. Based on the analysis, unit specific projects were identified in consensus with the unit heads. The consultants were visiting these units on a regular basis, helped in bringing awareness on need for change, handhold in implementing systems and practices. A formal review meeting was held once in two months along with the original equipment manufacturer customer to review the progress of various activities and provide necessary guidance. The details of visits to the units and the various activities undertaken

were periodically reported by the consultants in these meetings. A detailed phase wise reports were also circulated among the units for cross learning. At the end of each phase an audit was also done to monitor the projects whether all are being implemented as per the action plan finalized at the end of analysis stage. Mid way corrections are suggested by the auditors in discussion with the chief executive officers (CEO) and the consultants based on the findings of the audit.

Lean Implementation

The process of implementing lean practices in these nine units involved different steps like analyzing the current level of these units, capturing the current conditions and levels of adherence to lean principles using lean evaluation tools, setting targets / milestones includes both unit specific and common projects to be undertaken, detailed project list and the milestone based targets for all the units for each phase activities, broad action plan for the subsequent phases after analysis phase four milestones were planned and formulation of review mechanism to monitor progress and targeted milestones.

At the end of analysis, it was very clear that the overall status of all the unit members were the same except for a few. Hence, after discussion with the CEOs and based on their consensus, the overall approach for the project was formulated. The activities planned included both common projects across all units and unit specific projects. The common projects were aimed at building the fundamental systems, data collection practices, analysis in these units to ensure growth and sustainability. The unit specific projects included the areas where they had abundant scope for improvement using the existing infrastructure without investing in fresh resources. Some of the projects undertaken were as follows.

- Product Quality improvement - parts per million (PPM) reduction
- Delivery schedule achievement - improving delivery performance
- Productivity improvement - elimination of idle time
- Setting time reduction - elimination of non value adding activities
- 5S Score - improving the workplace organization
- Kaizen - improving the culture of worker involvement

Some of the other systems introduced in the units were internal kanban system, visual controls, tool development time line plan, cutting tool inserts issue monitoring plan, etc.

RESULTS AND DISCUSSIONS

By implementing the different lean tools in the above projects and systems in the units, the productivity and competitiveness of the units were increased in terms of reduction of in-house rejections, improvement of overall equipment effectiveness (OEE) and 5S, implementation of more Kaizen's reducing change over time, optimizing inventory, improving productivity, etc. The benefits achieved was measured in terms of money value wherever possible and given in Table 1. Other qualitative benefits and performance measures are captured and provided in Table 2. From the Table 1, it was found that there is a direct savings of rupees six million for these nine units through lean implementation over a period of one and half years. More than the direct savings, the improvement in the productivity and competitiveness of the units have given the units an edge over their competitors. It has brought them more jobs as they are in a better position to offer competitive prices and higher quality. Also they are able to take up more challenging jobs as they are equipped with employees who can solve any challenge through brainstorming and Kaizen's. Their machines are always available for

production as they had implemented total productive maintenance and improved their OEE considerably. Similarly, the graphical representations of improvement in two parameters of productivity improvement by PPM reduction and delivery performance by 5S are shown in Figure 1 to Figure 4.

Table 1: Achievement in the Cluster of Industries

| Nature of Project | Quantitative Benefits | Qualitative Benefits | Monetary Benefits |
|--------------------------------|---|--|------------------------|
| Minimizing In-house rejections | PPM reduction is about 55% | Importance of data collection and data based decision making Awareness of Pareto analysis, Cause and effect diagram, Why-why analysis to find the root cause of the problem | Rs.31.02 lakhs |
| OEE Improvement | OEE has been improved by about 70% | Major downtime is addressed Machine utilization improved | Rs. 1.05 lakhs |
| 5S Improvement | 5S levels has been increased by about 145% | Unwanted items were removed and maximum space was utilised Searching of items reduced by proper arrangement Visual controls for better shop floor maintaining | Rs. 6.30 lakhs |
| Kaizen's Implementation | Fifty different Kaizen's were implemented in all nine units | Employee morale has been improved Active participation of employees in day-to-day shop-floor problems and coming up with suggestion to solve it | Rs. 3.06 lakhs |
| Changeover time reduction | Reduction in changeover time about 54% | Awareness on SMED, VA and NVA Importance of tool kits in changeover to reduce the time taken | Rs. 2.52 lakhs |
| Optimization of inventory | Reduction in inventory about 43% | Importance of raw material planning Better delivery performance | Rs. 4.03 lakhs |
| Productivity Improvement | Improvement in productivity about 27% | Awareness on identifying and optimising operating parameters | Rs. 10.04 lakhs |
| Total Savings (Rs.) | | | Rs. 58.02 lakhs |

Table 2: Overall Benefits in Terms of Productivity and Competitiveness

| Sl. No. | Description | Performance Measures | | |
|---------|----------------------------|----------------------|--|--|
| | | Before | After | Remarks |
| 1 | Delivery performance | 55% | 85% | Five units achieved >90% Four units achieved >80% |
| 2 | PPM reduction | 7430 PPM | 3150 PPM | Overall 58% reduced with three units>70% reduction |
| 3 | Kaizen's | 30 no's | Five units-30 to 65 no's Four units-15 to 30 no's | 100 no's of Kaizen's have been received. |
| 4 | 5S implementation | 30% | 82% | 52% improved with 8 units above 80% |
| 5 | Change over time reduction | 130 mins | 60 mins | Reduction about 54% |
| 6 | Inventory turnover ratio | 7 | 13 | Improved |

| Table 2: Contd., | | | | |
|------------------|---------------------------|--|-----|---|
| 7 | Improving OEE | 50% | 75% | 25% improved with three units above 70% |
| 8 | On-time tools development | 0% | 70% | Improved |
| | Training programmes | 5S, Lean practices, Tool monitoring, Maintenance practices, Financial management, etc. | | |

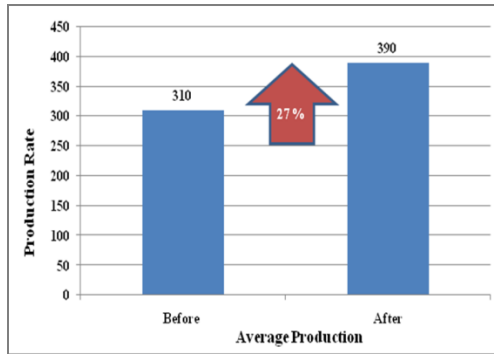


Figure 1: Productivity Improvement

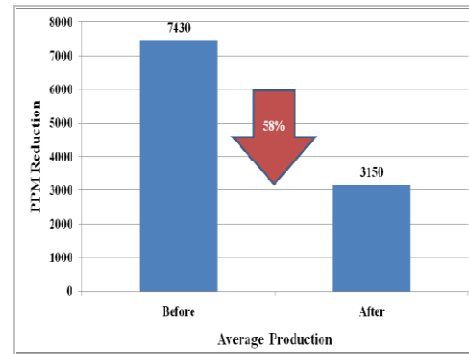


Figure 2: PPM Reduction

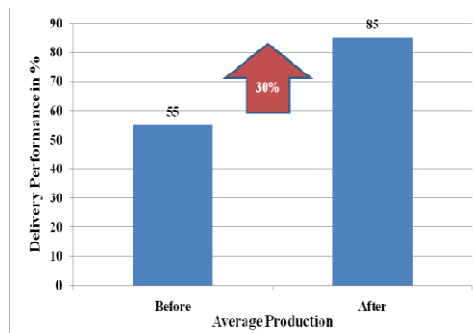


Figure 3: Delivery Performance

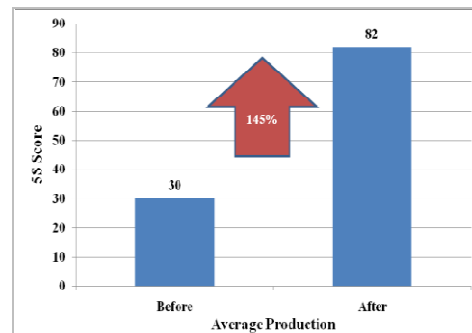


Figure 4: 5S Score Improvement

CONCLUSIONS

Based on the above study, analysis and observed results, the following conclusions have been arrived.

- The achievement in 5S practices keeps the working environment pleasant and accident free.
- On-time development of the tools required in press shop which was very rare earlier helps in achieving the production target and keeps the customer delighted.
- The inventory turnover ratio has increased from 7 to 13 which means the inventory undergoes six more cycles in a year.
- The change over time was reduced from 130 minutes to 60 minutes which increased the production time by 70 minutes for every change over.
- About one hundred Kaizens were implemented at an average of 11 per unit and resulted in saving of material, process time, effort and production rate.
- Reduction in PPM is the result of using the data more effectively and applying more lean tools to eliminate the root causes of rejections and an improvement in all the units.

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